

Effects of Spaceflight and Simulated Microgravity on YAP1 Expression in Cardiovascular Progenitors: Implications for Cell-Based Repair.

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Public Summary:

Spaceflight alters many processes of the human body including cardiac function and cardiac progenitor cell behavior. The mechanism behind these changes remains largely unknown; however, simulated microgravity devices are making it easier for researchers to study the effects of microgravity. To study the changes that take place in cardiac progenitor cells in microgravity environments, adult cardiac progenitor cells were cultured aboard the International Space Station (ISS) as well as on a clinostat and examined for changes in Hippo signaling, a pathway known to regulate cardiac development. Cells cultured under microgravity conditions, spaceflight-induced or simulated, displayed upregulation of downstream genes involved in the Hippo pathway such as YAP1 and SOD2. YAP1 is known to play a role in cardiac regeneration which led us to investigate YAP1 expression in a sheep model of cardiovascular repair. Additionally, to mimic the effects of microgravity, drug treatment was used to induce Hippo related genes as well as a regulator of the Hippo pathway, miRNA-302a. These studies provide insight into the changes that occur in space and how the effects of these changes relate to cardiac regeneration studies.

Scientific Abstract:

Spaceflight alters many processes of the human body including cardiac function and cardiac progenitor cell behavior. The mechanism behind these changes remains largely unknown; however, simulated microgravity devices are making it easier for researchers to study the effects of microgravity. To study the changes that take place in cardiac progenitor cells in microgravity environments, adult cardiac progenitor cells were cultured aboard the International Space Station (ISS) as well as on a clinostat and examined for changes in Hippo signaling, a pathway known to regulate cardiac development. Cells cultured under microgravity conditions, spaceflight-induced or simulated, displayed upregulation of downstream genes involved in the Hippo pathway such as YAP1 and SOD2. YAP1 is known to play a role in cardiac regeneration which led us to investigate YAP1 expression in a sheep model of cardiovascular repair. Additionally, to mimic the effects of microgravity, drug treatment was used to induce Hippo related genes as well as a regulator of the Hippo pathway, miRNA-302a. These studies provide insight into the changes that occur in space and how the effects of these changes relate to cardiac regeneration studies.

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